AMENDMENTS TO THE CLAIMS

Please replace the pending claims with the following claim listing:

1. **(Currently Amended)** An optical signal quality monitoring circuit comprising:

photoelectric conversion means for converting an input optical signal to an electrical signal;

sampling means for sampling and converting the electrical signal with any given repetition frequency f_1 to digital sampling data by an analog to digital conversion; and

signal processing means for correcting and evaluating ~~optical an signal quality parameter of the optical signal~~ an averaged Q value based on correction factors obtained in advance according to a change in the signal bit rate of the optical ~~signal by using the sampling data~~ signal, wherein the signal processing means:

calculates, by using the sampling data, averages μ_0 and μ_1 and standard deviations σ_0 and σ_1 for two distributions of signal amplitude values that are mark part and space part, and

calculates the averaged Q value as an optical quality parameter of the optical signal using the calculated averages μ_0 and μ_1 and standard deviations σ_0 and σ_1.

2. **(Previously Presented)** The optical signal quality monitoring circuit according to Claim 1, further comprising:

signal bit rate information receiving means for receiving signal bit rate information of the optical signal, wherein

the signal processing means corrects the optical signal quality parameter of the optical signal on the basis of the received signal bit rate information.

3. **(Previously Presented)** The optical signal quality monitoring circuit according to Claim 1, further comprising:

control signal receiving means for receiving a control signal demanding the switchover of a signal bit rate of the optical signal;

a plurality of frequency filters corresponding to individually different signal bit rates; and

a selector for changing a plurality of the frequency filters, wherein

in response to receipt of the control signal, the signal processing means switches the selectors to measure the optical signal quality parameter of the optical signal, while sequentially changing frequency filters through which the electrical signal passes, and fixes the selector so that the electrical signal can pass through the frequency filters in which the optical signal quality parameter is maximized after the electrical signal has passed through all the frequency filters, and evaluates the optical signal quality parameter of the optical signal.

4. **(Original)** The optical signal quality monitoring circuit according to Claim 1, wherein the signal processing means periodically changes a correction value of optical signal quality parameter corresponding to individually different signal bit rates and evaluates the optical signal quality parameters of the optical signal.

5. **(Original)** The optical signal quality monitoring circuit according to Claim 1, further comprising:

bit rate detection means for detecting a signal bit rate of the optical signal by using the electrical signal, wherein

the signal processing means corrects the optical signal quality parameter of the optical signal on the basis of the detected signal bit rate.

6. **(Original)** The optical signal quality monitoring circuit according to Claim 1, further comprising:

a plurality of frequency filters corresponding to individually different signal bit rates; and

a selector for changing a plurality of the frequency filters, wherein

the signal processing means periodically switches the selectors to measure the optical signal quality parameter of the optical signal, while sequentially changing frequency filters through which the electrical signal passes and evaluates the optical signal quality parameter of the optical signal in which the optical signal quality parameters are maximized for each cycle.

7. **(Original)** The optical signal quality monitoring circuit according to Claim 1, further comprising:

bit rate detection means for detecting the signal bit rate of the optical signal by using the electrical signal;

a plurality of frequency filters corresponding to individually different signal bit rates and a selector for changing a plurality of the frequency filters, wherein

the signal processing means switches the selectors so that the electrical signal can pass through the frequency filters corresponding to the signal bit rates and evaluates the optical signal quality parameter of the optical signal.

8. **(Currently Amended)** The optical signal quality monitoring circuit according to Claim 1, wherein the photoelectric conversion means is provided with an optical electrical converter which converts the optical signal of repetition frequency f_0 to an electrical signal.

9. **(Previously Presented)** The optical signal quality monitoring circuit according to Claim 1, wherein the photoelectric conversion means comprises:

an optical electrical sampling circuit which samples an optical signal of bit rate f_0 by using an electrical pulse synchronized with a clock of repetition frequency f_1 to output a sampling optical signal; and

an optical electrical converter for converting the sampling optical signal to an electrical signal.

10. **(Previously Presented)** The optical signal quality monitoring circuit according to Claim 1, wherein the photoelectric conversion means comprises:

an optical-optical sampling circuit which samples an optical signal of bit rate f_0 by using an optical pulse synchronized with a clock of repetition frequency f_1 to output the sampling optical signal; and

an optical electrical converter for converting the sampling optical signal to an electrical signal.

11. **(Previously Presented)** The optical signal quality monitoring circuit according to Claim 1, wherein the signal processing means comprises:

threshold processing means which compares a signal amplitude of the sampling data with a predetermined threshold to classify the sampling data into two distributions, namely, a mark part and a space part of the binary signal;

summing processing means for calculating a sum of signal amplitude values of the sampling data and a sum of squares of the signal amplitude values for the two distributions;

Q value calculation processing means in which a standard deviation and an average value are determined from a sum of signal amplitude values of the sampling data and a sum of squares of the amplitude values for the respective two distributions and a Q value is calculated by referring to the standard deviation and the average value of distribution of the mark part as well as the standard deviation and the average value of distribution of the space part;

Q value correction and processing means for correcting the Q value according to the signal bit rate of the optical signal;

averaging processing means for measuring the corrected Q value multiple times and averaging the corrected Q value;

Q value memory means for memorizing the Q value corrected and averaged; and

alarm transfer processing means for transferring an alarm when the corrected and averaged Q value is lower than a reference Q value.

12. **(Previously Presented)** The optical signal quality monitoring circuit according to Claim 1, wherein the signal processing means comprises:

first threshold processing means which compares the signal amplitude of the sampling data with a first predetermined threshold to classify the sampling data into two distributions, namely, a mark part and a space part of the binary signal:

summing processing means for calculating a sum of signal amplitude values of the sampling data for the respective two distributions:

average value calculation processing means for measuring the average value from a sum of signal amplitude values of the sampling data calculated for the respective two distributions;

second threshold processing means in which the average values determined respectively for the two distributions are respectively regarded as second and third thresholds to classify the sampling data into a distribution of a second mark part consisting of a distribution greater in signal amplitude than the second threshold and a distribution line-symmetrical to the second threshold when the signal amplitude of the sampling data is greater than the second threshold and classify the sampling data into a distribution of the second space part consisting of a distribution smaller in signal amplitude than the third threshold and a distribution line-symmetrical to the third threshold when the signal amplitude of the sampling data is smaller than the third threshold;

second summing processing means for calculating a sum of squares of the signal amplitude of the sampling data for the respective two distributions of the second mark part and second space part;

Q value calculation processing means in which a standard deviation is determined by using a sum of the signal amplitude values and a sum of squares of the signal amplitude for the respective two distributions of the second mark part and second space part and a Q value is calculated by using the respective average values of the mark part and the space part as well as the respective standard deviations of the second mark part and the second space part;

averaging processing means for measuring the corrected Q values multiple times and averaging the corrected Q values after the Q value is corrected according to the signal bit rates of the optical signal;

Q value memory means for memorizing the corrected and averaged Q value; and

alarm transfer means for transferring an alarm when the corrected and averaged Q value is lower than a reference Q value which is previously memorized.

13. **(Previously Presented)** The optical signal quality monitoring circuit according to Claim 1, wherein the signal processing means comprises:

histogram processing means in which the signal amplitude of the sampling data is classified for every quantization value and a histogram is obtained by summing the frequency;

first threshold processing means for comparing the signal amplitude of the sampling data with a predetermined first threshold to classify the sampling data into two distributions, namely;

a mark part and a space part of the binary signal;

peak detection processing means in which a frequency peak is detected respectively for the two distributions of the mark part and the space part and a signal amplitude of the sampling data showing the peak frequency is set to an average value;

second threshold processing means in which the average values determined respectively for the two distributions are respectively regarded as second and third thresholds to classify the sampling data into a distribution of the second mark part consisting of the distribution greater in signal amplitude than the second threshold and the distribution line-symmetrical to the second threshold when the signal amplitude of the sampling data is greater than the second threshold and classify the sampling data into a distribution of the second space part consisting of the distribution smaller in signal amplitude than the third threshold and the distribution line-symmetrical to the third threshold when the signal amplitude of the sampling data is smaller than the third threshold;

second summing processing means for calculating a sum of squares of the signal amplitude of the sampling data for the respective two distributions of the second mark part and second space part;

Q value calculation processing means in which a standard deviation is determined by using a sum of the signal amplitude values and a sum of squares of the signal amplitude for the respective two distributions of the second mark part and second space part and a Q value is calculated by using the respective average values of the mark part and the space part as well as the respective standard deviations of the second mark part and the second space part;

Q value correction processing means for correcting the Q value according to the signal bit rate of the optical signal;

averaging processing means for measuring the corrected Q values multiple times and averaging the corrected Q values;

Q value memory means for memorizing the corrected and averaged Q value; and

alarm transfer means for transferring an alarm when the corrected and averaged Q value is lower than a reference Q value which is previously memorized.

14. **(Currently Amended)** The optical signal quality monitoring circuit according to Claim 1, wherein

the repetition frequency f_1 satisfies the formula of $f_1 = (n/m)f_0 \pm a$ and $\cancel{(n/m)^2\{k-(n/m)\}f_0}$ $\underline{(n/m)^2/\{k+(n/m)\}f_0} \leq a < (n/m)^2/\{k+(n/m)-1\}f_0$ (n, m, <u>and</u> k are natural numbers), and the signal processing means comprises:

the processing means for detecting a preponderant portion of an eye opening of the eye pattern obtained by overwriting digital data for every k unit;

Q value calculation processing means in which a frequency peak is detected for the respective distributions of the mark part and the space part around said part which is a maximum of the eye opening to determine the average value and the standard deviation from which the Q value is calculated;

Q value correction processing means for correcting the Q value according to the signal bit rate of the optical signal;

averaging processing means for measuring the corrected Q values multiple times and averaging the corrected Q values;

Q value memory means for memorizing the corrected and averaged Q value; and

alarm transfer means for transferring an alarm when the corrected and averaged Q value is lower than a reference Q value which is previously memorized.

15. **(Currently Amended)** An optical signal quality monitoring method comprising:

a step of converting an input optical signal to an electrical signal;

a step of sampling the electrical signal with any given repetition frequency f_1 and converting the electrical signal into digital sampling data through an analog to digital conversion;

a step of calculating, by using the sampling data, averages μ_0 and μ_1 and standard deviations σ_0 and σ_1 for two distributions of signal amplitude values that are mark part and space part, and calculating the averaged Q value as an optical quality parameter of the optical signal using the calculated averages μ_0 and μ_1 and standard deviations σ_0 and σ_1; and

a step of correcting and evaluating [[an]] the averaged Q value as the optical signal quality parameter of the optical signal based on correction factors obtained in advance according to changes in signal bit rate of the optical signal ~~by using the sampling data~~.

16. **(Original)** The optical signal quality monitoring method according to Claim 15, wherein the step of evaluating optical signal quality parameters of the optical signal comprises:

a step which compares the signal amplitude of the sampling data with a predetermined threshold to classify the sampling data into two distributions, namely, a mark part and a space part of the binary signal;

a step of calculating a sum of signal amplitude values of the sampling data and a sum of squares of the signal amplitude value respectively for the two distributions;

a step in which a standard deviation and an average value are determined from a sum of signal amplitude values of the sampling data and a sum of squares of the amplitude value for the respective two distributions, and a Q value is calculated by using the standard deviation and the average value of the distribution of the mark part as well as the standard deviation and the average value of the distribution of the space part;

a step of correcting the Q value according to the signal bit rate of the optical signal;

a step of measuring the corrected Q value multiple times and averaging the corrected Q value;

a step of comparing the corrected and averaged Q value with a reference Q value which is previously memorized; and

a step of transferring an alarm when the corrected and averaged Q value is lower than a reference Q value which is previously memorized.

17. **(Original)** The optical signal quality monitoring method according to Claim 15, wherein the step of evaluating optical signal quality parameters of the optical signal comprises:

a step which compares the signal amplitude of the sampling data with a predetermined first threshold to classify the sampling data into two distributions, namely, a mark part and a space part of the binary signal;

a step of calculating a sum of signal amplitude values of the sampling data for the respective two distributions;

a step of calculating an average value from a sum of signal amplitude values of the sampling data calculated for the respective two distributions;

a step in which the average values determined respectively for the two distributions are respectively regarded as second and third thresholds to classify the sampling data into a distribution of the second mark part consisting of the distribution greater in signal amplitude than the second threshold and the distribution line-symmetrical to the second threshold when the signal amplitude of the sampling data is greater than the second threshold and classify the sampling data into a distribution of the second space part consisting of the distribution smaller in signal amplitude than the third threshold and the distribution line-symmetrical to the third threshold when the signal amplitude of the sampling data is smaller than the third threshold;

a step of calculating a sum of squares of the signal amplitude of the sampling data respectively for the two distributions of the second mark part and second space part;

a step in which a standard deviation is determined from a sum of the signal amplitude values and a sum of squares of the signal amplitude for the respective two distributions of the second mark part and second space part, and a Q value is calculated by using the respective average values of the mark part and the space part as well as the respective standard deviations of the second mark part and the second space part;

a step of measuring the corrected Q values multiple times and averaging the corrected Q values after the Q value is corrected according to the signal bit rate of the optical signal;

a step of memorizing the corrected and averaged Q value; and

a step of transferring an alarm when the corrected and averaged Q value is lower than a reference Q value which is previously memorized.

18. **(Original)** The optical signal quality monitoring method according to Claim 15, wherein the step of evaluating optical signal quality parameters of the optical signal comprises:

a step in which the signal amplitude of the sampling data is classified for every quantization value and a histogram is obtained by summing the frequency;

a step of comparing the signal amplitude of the sampling data with a predetermined first threshold to classify the sampling data into two distributions, namely, a mark part and a space part of the binary signal;

a step in which a frequency peak is detected respectively for the two distributions of the mark part and the space part and a signal amplitude of the sampling data showing the peak frequency is set as an average value;

a step in which the average values determined respectively for the two distributions are regarded as second and third thresholds to classify the sampling data into a distribution of the second mark part consisting of the distribution greater in signal amplitude than the second threshold and the distribution line-symmetrical to the second threshold when the signal amplitude of the sampling data is greater than the second threshold and classify the sampling data into a distribution of the second space part consisting of the distribution smaller in signal amplitude than the third threshold and the distribution line-symmetrical to the third threshold when the signal amplitude of the sampling data is smaller than the third threshold;

a step of calculating a sum of squares of the signal amplitude of the sampling data for the respective two distributions of the second mark part and second space part;

a step in which a standard deviation is determined by using a sum of the signal amplitude values and a sum of squares of the signal amplitude for the respective two distributions of the second mark part and second space part and a Q value is calculated by using the respective average values of the mark part and the space part as well as the respective standard deviations of the second mark part and the second space part;

a step of correcting the Q value according to the signal bit rate of the optical signal;

a step of measuring the corrected Q values multiple times and averaging the corrected Q values;

a step of memorizing the corrected and averaged Q value; and

a step of transferring an alarm when the corrected and averaged Q value is lower than a reference Q value which is previously memorized.

19. **(Currently Amended)** The optical signal quality monitoring method according to Claim 15, wherein

the step of conversion to digital sampling data through analog to digital conversion samples the electrical signal by a repetition frequency f1 which satisfies $f_1 = (n/m)f_0 \pm a$ and ~~$(n/m)^2\{k+(n/m)\}f_0$~~ $\underline{(n/m)^2/\{k+(n/m)\}f_0} \leq a < (n/m)^2/\{k+(n/m)-1\}f_0$ (n, m and k are natural numbers), and

the step of evaluating optical signal quality parameters of the optical signal comprises:

a step of detecting a preponderant portion of an eye opening of the eye pattern obtained by overwriting digital data for every k unit;

a step in which a frequency peak is detected for the respective distributions of the mark part and the space part around said part which is a maximum of the eye opening to determine the average value and the standard deviation, from which the Q value is calculated;

a step of correcting the Q value according to the signal bit rate of the optical signal;

a step of measuring the corrected Q values multiple times and averaging the corrected Q values;

a step of memorizing the corrected and averaged Q value; and

a step of transferring an alarm when the corrected and averaged Q value is lower than a reference Q value which is previously memorized.

20. **(New)** An optical signal quality monitoring circuit, comprising:

photoelectric conversion means for converting an input optical signal to an electrical signal;

sampling means for sampling and converting the electrical signal with any given repetition frequency f_1 to digital sampling data by an analog to digital conversion;

signal processing means for correcting and evaluating an optical signal quality parameter of the optical signal according to a change in the signal bit rate of the optical signal by using the sampling data;

a plurality of frequency filters corresponding to individually different signal bit rates; and

a selector for changing a plurality of the frequency filters, wherein

the signal processing means periodically switches the selectors to measure the optical signal quality parameter of the optical signal, while sequentially changing frequency filters through which the electrical signal passes and evaluates the optical signal quality parameter of the optical signal in which the optical signal quality parameters are maximized for each cycle.